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LEPTOYPHA ELLIPTICA MCATEE AND *L. ILICIS* DRAKE (HEMIPTERA: TINGIDAE): NEW DISTRIBUTION RECORDS OF SELDOM-COLLECTED LACE BUGS, WITH CLARIFICATION OF HOST-PLANT RELATIONSHIPS

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Abstract.—Previously published information on the host plant of *Leptoypha elliptica* McAtee and *L. ilicis* Drake—holly, *Ilex* sp. (Aquifoliaceae)—is based on misidentification of the actual host. Both lace bugs specialize on shrubs of the genus *Forestiera* (Oleaceae) and, thus, develop on oleaceous plants like nearly all other species of *Leptoypha*. In addition to a clarification of host associations for these little-known tingids, new distribution records and biological notes are provided.

Key Words: insect distribution, *Forestiera* spp., host-plant relationships

Holly, *Ilex* sp. (Aquifoliaceae), is the only recorded host plant of the lace bug *Leptoypha ilicis* Drake; the specific epithet reflects this tingid's collection on a shrub presumed to be a species of *Ilex*. A second lace bug, *L. elliptica* McAtee, also was taken on "*Ilex*" sp. at the type locality of *L. ilicis* in Georgia (Drake 1919, McAtee 1919). My 1985 collection of both species on "holly" in Tennessee supported an aberrant host association in a genus that otherwise develops on members of the Oleaceae.

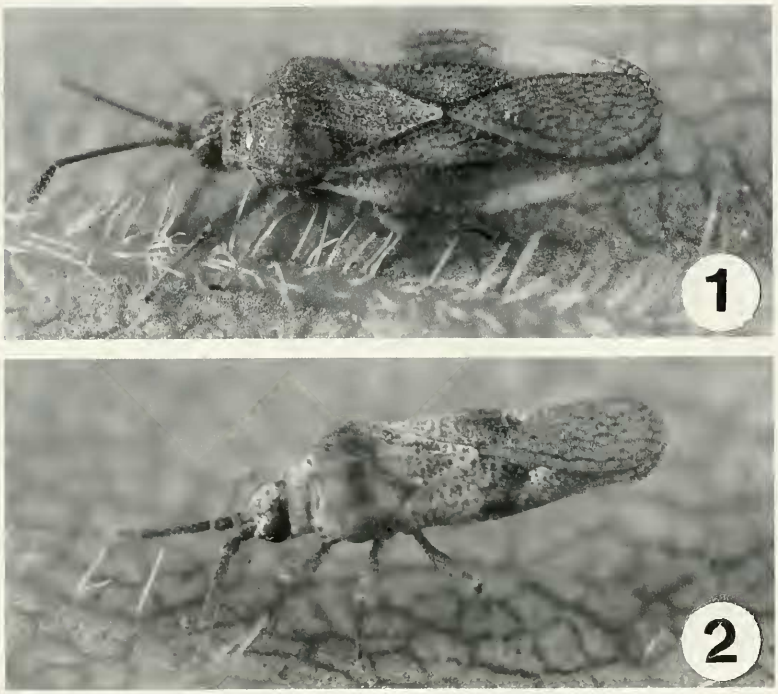
My eventual discovery that the host plant in Tennessee was not a holly but an oleaceous shrub, glade privet (*Forestiera ligustrina* [Michaux] Poiret), suggested that the "*Ilex*" in Georgia had been similarly misidentified in 1917 when *L. ilicis* was first collected. A 1991 trip to Stone Mountain, Ga., the type locality of *L. ilicis*, plus additional fieldwork, confirmed my hypothesis that *L. ilicis*, and the often syntopic *L. elliptica*, develop on species of *Forestiera*.

Here, in addition to clarifying host relationships for both tingids, I provide new distribution records and biological notes. Voucher material has been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Leptoypha elliptica McAtee (Fig. 1)

Described from "Texas" without host-plant data by McAtee (1917), this tingid has since been reported from Florida and Georgia (Drake 1918), Indiana (Blatchley 1926), Missouri (Froeschner 1944), and Tennessee (Drake and Ruhoff 1965). It was included in a list of the Tingidae of Oklahoma (Drew and Arnold 1977) because the recorded distribution suggested its eventual collection in that state. Drake's (1919) record of holly as the host on Stone Mountain, Ga., was based on the miridologist H.H. Knight's apparent misidentification of *F. ligustrina*. The Texas record from "swamp bush" (Drake 1918) almost certainly refers to swamp privet (*F. acuminata;* see Discussion).

New collection records (* = new state



Figs. 1–2. 1, *Leptophya elliptica*. 2, *L. ilicis*.

record).—GEORGIA: DeKalb Co., Stone Mountain, southwestern slope ca. 400 m, 3 May 1991. *ILLINOIS: Johnson Co., Belknap-Karnak Rd., SW. of Belknap, 8 June 1991. INDIANA: Knox Co., co. rd. 1300-S nr. Swan Pond, 13 km NW. of Decker, 7 June 1991. *KENTUCKY: Ballard Co., Rt. 51 NE. of Wickcliffe, 9 June 1991. MISSOURI: Mississippi Co., Birds Point, 9 June 1991 (nymphal exuviae only); New Madrid Co., New Madrid, 9 June 1991. *SOUTH CAROLINA: Aiken Co., Savannah River Bluffs Heritage Preserve, ca. 5 km NW. of North Augusta, 18 April 1992 (nymphs only, reared to adulthood), 12 May 2001. TENNESSEE: Davidson Co., Couchville Glade, NNE. of LaVergne, 10 June 1997; Long Hunter State Recreation Area, 29 May 1985, 19 April 1991; Mt. View Rd. Cedar Glade, NNW. of LaVergne, 12 June 1997, 13 May 2000; Dyer Co., Rt. 78, 1 km N. of Obion River, 1.5 km S. of Bogota, 2 June 1985, 9 June 1991; Rutherford Co., Flat Rock Cedar Glades & Barrens State Natural Area, 8.5 km NNE. of Murfreesboro, 11 June 1997, 14 May 2000; Sunnybell Glade, SW. of Mona, 12 June 1997; Wilson Co., Lane Farm Glade, NNW. of Silver Hill, 10 June 1997.

Host plants.—*Forestiera ligustrina* was the host for collections in Georgia and South Carolina, plus Davidson, Rutherford, and Wilson counties in Tennessee. In other cases the host was *F. acuminata* (Michaux) Poiret.

Leptoypha ilicis Drake
(Fig. 2)

Drake (1919) described *L. ilicis* from Stone Mountain, Ga., mentioning its similarity to *L. mutica* (Say). The type series was collected in June 1917 on "holly" but, as noted above, this supposed host association is erroneous. Additional records of this species have been few: Florida (Blatchley 1926, 1928), Oklahoma, and Texas (Hurd 1946). Hurd's (1946) New Hampshire record, which Bailey (1951) said required verification, has been excluded from

subsequent catalogs of the family (Drake and Ruhoff 1965, Froeschner 1988).

New collection records (* = new state record; unless cited completely, dates and specific localities are the same as those provided for *L. elliptica*).—GEORGIA: Columbia Co., Heggies Rock, E. of Appling, 5 April 1997; DeKalb Co., Pleasant Hill outcrop, N. of Lithonia, 7 July 1996, and Stone Mountain. *ILLINOIS: Johnson Co. *INDIANA: Knox Co. *KENTUCKY: Ballard Co. *MISSOURI: Mississippi and New Madrid counties. *SOUTH CAROLINA: Aiken Co. (12 May 2001 only). *TENNESSEE: Davidson, Dyer, Rutherford, and Wilson counties.

Host plants.—Because this species generally co-occurred with *L. elliptica*, its hosts are the same as listed under that species: *F. ligustrina* (Georgia and South Carolina, plus Davidson, Rutherford, and Wilson counties in Tennessee) and *F. acuminata* (all other localities).

Discussion

Froeschner (1944) reported adults and nymphs of *L. elliptica* from Missouri but did not mention a host plant. The actual host relationships have gone unrecorded for both *L. elliptica* and *L. ilicis* since the original descriptions of these lace bugs appeared more than 80 years ago. My recent fieldwork now demonstrates that the specific epithet *L. ilicis* is a misnomer based on misidentification of the oleaceous shrub *F. ligustrina* at the type locality. Even this lace bug's other known host, *F. acuminata*, can be confused with holly (Stephens 1973). Both *L. elliptica* and *L. ilicis* specialize on species of *Forestiera*, and they often are syntopic. The two species are easily distinguished; the adults of *L. elliptica* are broadly elliptical, whereas those of *L. ilicis* are narrowly oblong and subparallel (see Figs. 1, 2). The collection of *L. ilicis* from *Vaccinium* sp. (Blatchley 1928) and in "palm jungle sweepings" (Hurd 1946) should be considered accidental occurrences.

All records of these lace bugs fall within the known distributions of their principal hosts, *F. acuminata* and *F. ligustrina*. Although these plants do not range throughout the eastern United States (they do not occur north or east of central Kentucky and Tennessee and southern South Carolina), they are the most widely distributed members of this small New World genus [ca. 15 spp. (Everett 1981)]. That most entomologists are unfamiliar with these inconspicuous plants likely has contributed to the scarcity of both lace bugs in collections. Neither tingid was taken during surveys of the lace bugs of Georgia (Beshear et al. 1976, Beshear 1981) and Oklahoma (Drew and Arnold 1977), despite historical records of both species from Georgia and of *L. ilicis* from Oklahoma (Drake and Ruhoff 1965).

Forestiera acuminata occurs sporadically along stream and river banks and in bottomland swamps and sloughs from southern Indiana and central Illinois, west to southeastern Kansas, eastern Oklahoma, and Texas, and eastward to southern South Carolina, Georgia, and Florida (Little 1977, 1980; Godfrey 1988; Gleason and Cronquist 1991). This weak, leaning, straggly, and shade-tolerant shrub or small tree often grows under larger trees (Deam 1932, Brown and Kirkman 1990). Most abundant in Arkansas, Missouri, and Texas, swamp privet generally attains its largest size in Louisiana (Sargent 1922). This likely was the plant on which Froeschner (1944) found nymphs of *L. elliptica* in Missouri.

Forestiera ligustrina, a deciduous shrub of limestone outcrops and sandy or rocky soil, has a more restricted range than *F. acuminata*. Glade privet is found irregularly from central Kentucky and Tennessee to eastern Texas, southern South Carolina, southwestern Georgia, southern Alabama, and northern Florida (Godfrey 1988, Gleason and Cronquist 1991). It is a characteristic plant of shrub thickets adjacent to most eastern limestone (cedar) glades (e.g., Meyer 1937, Quarterman et al. 1993, Baskin et al. 1995, Baskin and Baskin 1999).

Both lace bugs, like other members of

the genus, are mesophyll feeders; they colonize lower leaf surfaces of *Forestiera* species and cause chlorosis on upper surfaces. Foliar chlorosis usually is light and patchily distributed on host plants. Assuming that adults overwinter, which is typical of other *Leptoypha* species (Mead 1975, Sheeley and Yonke 1977), they become active in early spring. In the present study, late instars of *L. elliptica* were observed in mid-April in Tennessee and South Carolina. The collection of fifth instars of *L. elliptica* in Tennessee in late May and of *L. ilicis* in Georgia in early July likely represented a second generation. Other *Leptoypha* species, such as *L. mutica* and *L. costata* Parshley, are bivoltine or trivoltine (Dickerson and Weiss 1916, Sheeley and Yonke 1977).

In addition to the need to clarify details of their life histories, other biological aspects of these lace bugs warrant attention. Do *L. elliptica* and *L. ilicis* use other *Forestiera* species as hosts? Does the ash-feeding *L. mutica* include *F. acuminata* in its host range, as suggested by its collection on this plant in Texas (Drake 1918), or was the presence of adults on swamp privet strictly accidental? Two apparent problems that were suggested by Mead (1975)—the taxonomic status of *L. ilicis* and puzzling degree of intraspecific variation in *L. mutica*—will be addressed in a forthcoming review of *Leptoypha* by Thomas J. Henry.

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Literature Cited

Bailey, N. S. 1951. The Tingoidea of New England and their biology. Entomologica Americana 31: 1–140.

Baskin, J. M. and C. C. Baskin. 1999. Cedar glades of the southeastern United States, pp. 206–219. *In* Anderson, R. C., J. S. Fralish, and J. M. Baskin, eds. Savannas, Barrens, and Rock Outcrop Communities of North America. Cambridge University Press, Cambridge.

Baskin, J. M., D. H. Webb, and C. C. Baskin. 1995. A floristic plant ecology study of the limestone glades of northern Alabama. Bulletin of the Torrey Botanical Club 122: 226–242.

Beshear, R. J. 1981. New records of Georgia lace bugs (Homoptera [*sic*]: Tingidae). Journal of the Georgia Entomological Society 16: 266.

Beshear, R. J., H. H. Tippins, and J. O. Howell. 1976. The lace bugs (Tingidae) of Georgia. University

of Georgia Agricultural Experiment Station Research Bulletin 188: 1–29.

Blatchley, W. S. 1926. Heteroptera or True Bugs of Eastern North America, with Especial Reference to the Faunas of Indiana and Florida. Nature Publishing, Indianapolis, Ind. 1,116 pp.

———. 1928. Notes on the Heteroptera of eastern North America with descriptions of new species, I. Journal of the New York Entomological Society 36: 1–23.

Brown, C. L. and L. K. Kirkman. 1990. Trees of Georgia and Adjacent States. Timber Press, Portland, Ore. 292 pp.

Deam, C. C. 1932. Trees of Indiana (2nd rev. ed.). Fort Wayne Printing, Fort Wayne, Ind. 326 pp.

Dickerson, E. L. and H. B. Weiss. 1916. Notes on *Leptoypha mutica* Say (Hemip.). Entomological News 27: 308–310.

Drake, C. J. 1918. Notes on North American Tingidae (Hem.-Het.). Bulletin of the Brooklyn Entomological Society 13: 86–88.

———. 1919. On some North American Tingidae (Hemip.). Ohio Journal of Science 19: 417–421.

Drake, C. J. and F. A. Ruhoff. 1965. Lacebugs of the World: A Catalog (Hemiptera: Tingidae). Smithsonian Institution, Washington, D.C. 634 pp.

Drew, W. A. and D. C. Arnold. 1977. Tingoidea of Oklahoma (Hemiptera). Proceedings of the Oklahoma Academy of Science 57: 29–31.

Everett, T. H. 1981. The New York Botanical Garden Illustrated Encyclopedia of Horticulture. Vol. 4, Di-Fu. Garland Publishing, New York. pp. 1059–1422.

Froeschner, R. C. 1944. Contributions to a synopsis of the Hemiptera of Missouri, Pt. III. Lygaeidae, Pyrrhocoridae, Piesmidae, Tingidae, Enicocephalidae, Phymatidae, Ploiariidae, Reduviidae, Nabidae. American Midland Naturalist 31: 638–683.

———. 1988. Family Tingidae Laporte, 1807 (=Tingididae; Tingitidae). The lace bugs, pp. 708–733. *In* Henry, T. J. and R. C. Froeschner, eds. Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States. E. J. Brill, Leiden.

Gleason, H. A. and A. Cronquist. 1991. Manual of Vascular Plants of Northeastern United States and Adjacent Canada, 2nd ed. New York Botanical Garden, Bronx, N.Y. 910 pp.

Godfrey, R. K. 1988. Trees, Shrubs, and Woody Vines of Northern Florida and Adjacent Georgia and Alabama. University of Georgia Press, Athens. 734 pp.

Hurd, M. P. 1946. Generic classification of North American Tingoidea (Hemiptera-Heteroptera). Iowa State College Journal of Science 20: 429–492.

Little, E. L., Jr. 1977. Atlas of United States trees, Vol. 4. Minor eastern hardwoods. U.S. Department of Agriculture Forest Service Miscellaneous Publication 1342. 17 pp. + 230 maps.

———. 1980. The Audubon Society Field Guide to North American Trees: Eastern Region. Alfred A. Knopf, New York. 714 pp.

McAtee, W. L. 1917. Key to the Nearctic species of *Leptoypha* and *Leptostyla* (Heteroptera Tingidae). Bulletin of the Brooklyn Entomological Society 12: 55–64.

———. 1919. Corrections and additions to an article on *Leptoypha* and *Leptostyla* (Heteroptera; Tingidae). Bulletin of the Brooklyn Entomological Society 14: 142–144.

Mead, F. W. 1975. The fringetree lace bug, *Leptoypha mutica* (Say) (Hemiptera: Tingidae). Florida Department of Agriculture and Consumer Services, Division of Plant Industry, Entomology Circular 161. 2 pp.

Meyer, A. M. 1937. An ecological study of cedar glade invertebrates near Nashville, Tennessee. Ecological Monographs 7: 403–443.

Quarterman, E., M. P. Burbanck, and D. J. Shure. 1993. Rock outcrop communities: limestone, sandstone, and granite, pp. 35–86. *In* Martin, W. H., S. G. Boyce, and A. C. Echternacht, eds. Biodiversity of the Southeastern United States: Upland Terrestrial Communities. John Wiley, New York.

Sargent, C. S. 1922. Manual of the Trees of North America (Exclusive of Mexico). Houghton Mifflin, Boston. 910 pp.

Sheeley, R. D. and T. R. Yonke. 1977. Immature stages and biology of *Atheas austroriparius* and *Leptoypha costata* (Hemiptera: Tingidae). Annals of the Entomological Society of America 70: 603–614.

Stephens, H. A. 1973. Woody Plants of the North Central Plains. University Press of Kansas, Lawrence. 530 pp.